# HIGHWAY PATROL OFFICERS' RETIREMENT SYSTEM of the STATE OF MONTANA

## ACTUARIAL VALUATION as of June 30, 2008

Prepared by

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November 3, 2008

Retirement Board
Public Employees' Retirement Administration
State of Montana

Dear Members of the Board:

At your request, we have completed an actuarial valuation of the Highway Patrol Officers' Retirement System as of June 30, 2008. Details about the actuarial valuation are contained in the following report. This report reflects the benefit provisions and contribution rates in effect on the valuation date.

Actuarial computations presented in this report are for purposes of analyzing the sufficiency of future contributions. Actuarial computations under GASB Statement No. 25 are for purposes of fulfilling financial accounting requirements. The computations in this report have been made on a basis consistent with our understanding of the Retirement Board's funding policies and GASB Statement No. 25. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, different determinations may be needed for other purposes.

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Respectfully submitted,

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## ACTUARIAL CERTIFICATION

To the best of our knowledge and belief, this report is complete and accurate and contains sufficient information to fully and fairly disclose the funded condition of the Highway Patrol Officers' Retirement System as of June 30, 2008.

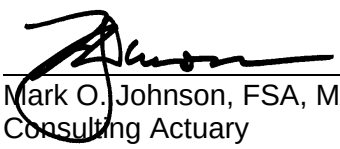
In preparing the valuation, we relied upon the financial information, membership data, and benefit provisions furnished by the System. Although we did not audit this data, we compared the data for this and the prior valuation and tested for reasonableness. Based on these tests, we believe the data to be sufficiently accurate for the purposes of our calculations. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

The Retirement Board has sole authority to determine the actuarial assumptions and methods used for the valuation of the System. The Board adopted all of the actuarial methods and assumptions used in the 2008 valuation.

The findings have been determined according to actuarial assumptions and methods that were chosen on the basis of recent experience of the System and of current expectations concerning future economic conditions. In our opinion, the assumptions used in the actuarial valuation are appropriate for purposes of the valuation, are internally consistent, and reflect reasonable expectations. The assumptions represent our best estimate of future conditions affecting the System. Nevertheless, the emerging costs of the System will vary from those presented in this report to the extent that actual experience differs from that projected by the assumptions.

The actuarial valuation was prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the applicable Standards of Practice adopted by the Actuarial Standards Board of the American Academy of Actuaries. In addition, the assumptions and methods used meet the parameters set for disclosures by Governmental Accounting Standards Board Statement No. 25.

The undersigned are independent actuaries, Fellows of the Society of Actuaries, a Members of the American Academy of Actuaries, an Enrolled Actuary, and experienced in performing valuations for large public employee retirement systems.



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# SECTION 1
# SCOPE OF THE REPORT

This report presents the results of our actuarial valuation of the System as of June 30, 2008. Actuarial computations presented in this report are for purposes of analyzing the sufficiency of future contributions.

A summary of the findings resulting from this valuation is presented in Section 2 of the report and the underlying calculations are summarized in more detail in Section 3.

All of the calculations of the valuation were carried out using certain assumptions as to the future experience of the System in matters affecting the actuarial cost. Section 4 summarizes the most important of these assumptions and describes the actuarial methods used to calculate costs.

Section 5 outlines the benefit provisions of the System.

The membership data which were supplied to us are summarized in Section 6.

## SECTION 2
## SUMMARY OF FINDINGS AND ANALYSIS OF THE FUNDING LEVEL

The costs of a retirement system are not determined by the actuary. The ultimate costs of a system are determined by adding all of the benefits and expenses that are paid, and subtracting all investment earnings. These costs cannot be determined exactly until the last member or beneficiary has received the final benefit payment due.

The purpose of an actuarial valuation is to provide a timely best estimate of the ultimate costs in order to allocate them to the appropriate generation of members and taxpayers. The ideal goal is for contributions to remain essentially a constant percentage of covered payroll as long as the assumptions and methods reflect the emerging experience of the system and its members with reasonable accuracy.

### MEMBERSHIP DATA

We have developed the following comparisons between the membership in this and the prior actuarial valuations:

| | June 30, 2008 | June 30, 2007 |
|---|---|---|
| Number of Members | | |
| Retirees and Beneficiaries | 290 | 284 |
| Vested Terminated | 13 | 14 |
| Non-vested Terminated | 7 | 8 |
| Active | 212 | 204 |
| Total Membership | 522 | 510 |

More detailed membership statistics are shown in Section 6.

### DETERMINATION OF NORMAL COST

The **Normal Cost** represents the cost assigned to an average member for a given year such that it would meet the continuing costs of that particular benefit, if contributed each year starting with the date of membership. The Entry Age Actuarial Cost Method is designed to produce a Normal Cost that remains a level percentage of salaries, so it is best expressed as a rate.

The following chart shows the Normal Cost from the 2007 valuation compared to the Normal Cost in this valuation. **TABLE 1** provides more details on the Normal Cost.

| | 2008 Actuarial Valuation | 2007 Actuarial Valuation |
|---|---|---|
| **Normal Cost Rate** | | |
| Service Retirement | 17.94% | 17.95% |
| Disability Retirement | .78 | .78 |
| Death | 1.02 | 1.04 |
| Withdrawal | 2.51 | 2.54 |
| **Total Normal Cost Rate** | **22.25**% | **22.31**% |

The Normal Cost Rate is expected to remain fairly stable as long as the benefits are not amended, experience emerges as assumed, the demographic characteristics of the membership remain reasonably consistent, and the actuarial assumptions are not changed.

## DETERMINATION OF THE ACTUARIAL LIABILITY

The next step in the actuarial valuation process is to project all future benefit payments from the System for current members and retirees. The level of benefits currently being paid is known, but assumptions are needed to estimate how long they will be paid, and the amount and timing of the payment of future benefits for active and inactive members who are not currently receiving payments.

The summation of the discounted values of all of the projected benefit payments for all current members, at the assumed rate of return, is called the **Actuarial Present Value of Projected Benefits**. Details are shown in **TABLE 2** and summarized below.

| ($000) | 2008 Actuarial Valuation | 2007 Actuarial Valuation |
|---|---|---|
| **Actuarial Present Value of Projected Benefits** | | |
| Retired Members | $ 95,758 | $ 92,621 |
| Inactive Members | 637 | 567 |
| Active Members | 59,708 | 54,846 |
| **Total Value of Projected Benefits** | **$ 156,103** | **$ 148,034** |

The **Actuarial Present Value of Future Normal Costs** is the value of all remaining Normal Costs expected to be received over the future working lifetime of current active members. The Actuarial Present Value of Future Normal Costs is subtracted from the Actuarial Present Value of Projected Benefits to arrive at the **Actuarial Liability,** the assets that would exist if the current Normal Cost Rate had been paid for all members since entry into the System, and if all actuarial assumptions had been realized. The following is a summary from **TABLE 2**.

| ($000) | 2008 Actuarial Valuation | 2007 Actuarial Valuation |
|---|---|---|
| Actuarial Present Value of: | | |
| Projected Benefits | $ 156,103 | $ 148,034 |
| Future Normal Costs | 21,420 | 19,728 |
| **Actuarial Liability** | **$ 134,683** | **$ 128,306** |

## DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS

The next step in the valuation process is to calculate the **Actuarial Value of Assets** that will be used to determine the funding status of the System. The market value of assets was reported to us as of June 30, 2008. However, because the underlying calculations in the actuarial valuation are long-term in nature, it is advantageous to smooth out short-term fluctuations in the market value of assets.

The asset smoothing method projects an Expected Value of Assets using the assumed rate of investment return, then recognizes the difference between the Expected Value and the Market Value over a four-year period. The calculation of the Actuarial Value of Assets is shown in **TABLE 3** and summarized below.

| ($000) | Gain or (Loss) | Reserve Factor | Smoothing Reserve | Value of Assets |
|---|---|---|---|---|
| **Market Value on June 30, 2008** | | | | $ 96,275 |
| 2005-06 | 818 | 25% | 204 | |
| 2006-07 | 8,819 | 50% | 4,409 | |
| 2007-08 | (13,118) | 75% | (9,838) | |
| Smoothing Reserve | | | $ (5,225) | 5,225 |
| **Actuarial Value of Assets** | | | | **$ 101,500** |

## UNFUNDED ACTUARIAL LIABILITY OR ACTUARIAL SURPLUS

The **Unfunded Actuarial Liability** is the excess of the Actuarial Liability over the Actuarial Value of Assets, which represents a liability that must be funded over time. Contributions in excess of the Normal Cost are used to amortize the Unfunded Actuarial Liability.

An **Actuarial Surplus** exists if the Actuarial Value of Assets exceeds the Actuarial Liability. The calculation of the Unfunded Actuarial Liability or Actuarial Surplus is shown in **TABLE 4** and summarized below.

| ($000) | 2008 Actuarial Valuation | 2007 Actuarial Valuation |
|---|---|---|
| Actuarial Liability | $ 134,683 | $ 128,306 |
| Actuarial Value of Assets | 101,500 | 95,758 |
| **Unfunded Actuarial Liability or (Actuarial Surplus)** | **$ 33,183** | **$ 32,548** |
| **Funded Ratio – Actuarial Value** | **75%** | **75%** |
| **Funded Ratio – Market Value** | **71%** | **80%** |

The **Funded Ratio** is equal to the Actuarial Value of Assets divided by the Actuarial Liability. A Funded Ratio of 100% means the Actuarial Value of Assets equals the Actuarial Liability, and the System could be financed by contributions equal to the Normal Cost, if all future experience emerges as assumed.

A Funded Ratio over 100% indicates the System has an Actuarial Surplus.

## ACTUARIAL GAINS AND LOSSES

Comparing the Unfunded Actuarial Liability as of two valuation dates does not provide enough information to determine if there were actuarial gains or losses. The correct comparison is between the Unfunded Actuarial Liability on the valuation date and the Expected Unfunded Actuarial Liability projected from the prior valuation date using the actuarial assumptions in effect for the one-year period.

**TABLE 5** shows the Actuarial Liability as of June 30, 2007, and the elements to project that figure forward to June 30, 2008: the Normal Cost, less benefits paid, plus a charge for interest at the assumed rate of 8% per year. The same table shows the Actuarial Value of Assets as of June 30, 2007, and the elements to project that figure forward to June 30, 2008: The net cash flow (contributions less benefits and expenses), plus a charge for interest at the assumed rate of 8%.

The following is a summary of the actuarial gains or losses during the one-year period.

| | ($000) |
|---|---|
| **Unfunded Actuarial Liability** | |
| Actual as of June 30, 2007 | $ 32,548 |
| Expected as of June 30, 2008 | $ 31,964 |
| Actual as of June 30, 2008 | 33,183 |
| **Actuarial (Gain) or Loss** | **$ 1,219** |
| **(Gain) or Loss by Source** | |
| Investment Loss | $ 287 |
| Liability Loss | 932 |
| Net from All Sources | $ 1,219 |

The liability loss includes $473,000 in salaries different than expected, $348,000 due to new participants, and $111,000 in other losses.

## CALCULATION OF CONTRIBUTION RATE

The statutory funding rate is tested in the valuation to determine if it is sufficient to cover the Normal Cost Rate plus an amortization payment for the Unfunded Actuarial Liability, if any, over no more than 30 years. The calculations are shown in **TABLE 6** and summarized below.

| Rates as a Percentage of Active Member Payroll | 2008 Actuarial Valuation | 2007 Actuarial Valuation |
|---|---|---|
| **Statutory Funding Rate** | 45.38% | 45.38% |
| **Normal Cost Rate** | 22.25 | 22.31 |
| **Available for Amortization** | 23.13% | 23.07% |
| **UAL (Surplus) ($000)** | $33,183 | $32,548 |
| Years to Amortize | 17.4 | 19.1 |
| Rate of Amortization | 23.13% | 23.07% |
| **Calculated Contribution Rate** | | |
| Normal Cost Rate | 22.25% | 22.31% |
| Rate of Amortization | 23.13 | 23.07 |
| Total Contribution Rate | 45.38% | 45.38% |

Based on the assumptions contained in this report, the current statutory funding rate of 45.38% of payroll is sufficient to fund the current and projected benefits from the System.

## DISCLOSURE INFORMATION - GASB NO. 25

The disclosure of the Schedule of Funding Progress calculated in accordance with Statement No. 25 of the Governmental Accounting Standards Board and is shown in **TABLES 7 AND 8**.

The Annual Required Contribution is equal to the Statutory Funding Rate of 45.38% for the 2007-08 fiscal year because the statutory funding rate met the parameters of Statement No. 25 in the previous valuation.

## CALCULATIONS BASED ON THE MARKET VALUE OF ASSETS

MCA 19-2-407, as amended by HB No. 771, requires this report to show how market performance is affecting the actuarial funding of the Retirement System. The June 30, 2008 market value of assets is $5.2 million less than the actuarial value of assets due to a negative 4.9% market return in the year ended June 30, 2008. If the market value of assets was used, the amortization period would be 21.5 years, and the funded ratio would be 71%.

## Summary of Key Valuation Results

| | | 2008 Valuation | 2007 Valuation | Percentage Change |
|---|---|---|---|---|
| **1.** | **Total Membership** | | | |
| A. | Active Members | 212 | 204 | 3.9% |
| B. | Vested Terminated Members | 13 | 14 | -7.1% |
| C. | Non-vested Terminated Members | 7 | 8 | -12.5% |
| D. | Retired Members and Beneficiaries | 290 | 284 | 2.1% |
| E. | Total Membership | 522 | 510 | 2.4% |
| **2.** | **Annual Salary** | | | |
| A. | Annual Total *($Thousands)* | $ 11,026 | $ 10,161 | 8.5% |
| B. | Annual Average per Active Member | $ 50,505 | $ 48,392 | 4.4% |
| **3.** | **Average Annual Allowance Payable** | | | |
| A. | Service Retirement | $ 25,308 | $ 24,324 | 4.0% |
| B. | Disability Retirement | $ 18,672 | $ 17,808 | 4.9% |
| C. | Survivors & Beneficiaries | $ 16,332 | $ 15,792 | 3.4% |
| D. | All Payees | $ 22,939 | $ 22,123 | 3.7% |
| **4.** | **Actuarial Liability *($Thousands)*** | | | |
| A. | Active Members | $ 38,288 | $ 35,118 | 9.0% |
| B. | Inactive Members | 637 | 567 | 12.3% |
| C. | Retired Members and Beneficiaries | 95,758 | 92,621 | 3.4% |
| D. | Total | $ 134,683 | $ 128,306 | 5.0% |
| **5.** | **Value of System Assets *($Thousands)*** | | | |
| A. | Fair Value | $ 96,275 | $ 102,801 | -6.3% |
| B. | Smoothing Reserve | 5,225 | (7,043) | |
| C | Actuarial Value | $ 101,500 | $ 95,758 | 6.0% |
| D. | Ratio of Actuarial Value to Fair Value | *105%* | *93%* | |
| **6.** | **Funded Status** | | | |
| A. | Unfunded Actuarial Liability *($Thousands)* | $ 33,183 | $ 32,548 | 2.0% |
| B. | Less, PCR-UAL | $ 0 | $ 0 | 0.0% |
| C. | Net Unfunded Actuarial Liability | $ 33,183 | $ 32,548 | 2.0% |
| D. | Funded Ratio *( 5C ÷ 4D )* | 75% | 75% | |
| E. | Net Funded Ratio *( 5C ÷ (4D+6B ))* | 75% | 75% | |
| **7.** | **Contribution Rates *(percent of salaries)*** | | | |
| A. | Statutory Funding Rate | 45.38% | 45.38% | 0.0% |
| B. | Less, Transfer to DB Ed Fund | 0.00% | 0.00% | 0.0% |
| C. | Net Statutory Contribution Rate | 45.38% | 45.38% | 0.0% |
| D. | Normal Cost Rate | 22.25% | 22.31% | -0.3% |
| E. | Available for Amortization of UAL *( 7C – 7D )* | 23.13% | 23.07% | 0.3% |
| F. | Period to Amortize | 17.4 | 19.1 | |
| G. | Projected 30-Year Level Funding Rate | 16.27% | 17.32% | -6.1% |
| H. | Projected Shortfall (Surplus) *( 7G – 7C )* | (6.86)% | (5.75)% | 19.3% |

## SECTION 3
## ACTUARIAL VALUATION RESULTS

The following tables document the findings of the actuarial valuation.

## TABLE 1
## NORMAL COSTS

| | 2008 Actuarial Valuation | 2007 Actuarial Valuation |
|---|---|---|
| **Normal Cost Rate** | | |
| Service Retirement | 17.94% | 17.95% |
| Disability Retirement | .78 | .78 |
| Death | 1.02 | 1.04 |
| Withdrawal | 2.51 | 2.54 |
| **Total Normal Cost Rate** | 22.25% | 22.31% |
| **Annual Normal Cost ($000)** | $ 2,454 | $ 2,255 |
| **Present Value of Future Normal Costs ($000)** | $ 21,420 | $ 19,728 |

## TABLE 2
## SUMMARY OF ACTUARIAL REQUIREMENTS

| ($000) | 2008 Actuarial Valuation | 2007 Actuarial Valuation |
|---|---|---|
| **Retired Members** | | |
| Service Retirement | $ 78,028 | $ 75,934 |
| Disability Retirement | 5,956 | 5,536 |
| Beneficiaries | 11,774 | 11,151 |
| Retired Member Total | $ 95,758 | $ 92,621 |
| **Inactive Members** | $ 637 | $ 567 |
| **Active Members** | | |
| Service Retirement | $ 53,945 | $ 49,517 |
| Disability Retirement | 1,755 | 1,610 |
| Pre-retirement Death | 1,655 | 1,525 |
| Withdrawal | 2,353 | 2,194 |
| Active Member Total | $ 59,708 | $ 54,846 |
| **Present Value of Future Projected Benefits** | $ 156,103 | $ 148,034 |
| Present Value of Future Normal Costs | 21,420 | 19,728 |
| **Actuarial Liability** | $ 134,683 | $ 128,306 |

## TABLE 3
## ACTUARIAL VALUE OF ASSETS

**($000)**

| Fiscal Year | Cash Flow | Expected Value | Gain or (Loss) | Market Value |
|---|---|---|---|---|
| 2004-05 | | | | 83,767 |
| 2005-06 | (2,422) | 87,950 | 818 | 88,768 |
| 2006-07 | (1,814) | 93,982 | 8,819 | 102,801 |
| 2007-08 | (1,569) | 109,393 | (13,118) | 96,275 |

| Fiscal Year | Gain or (Loss) | Reserve Factor | Smoothing Reserve |
|---|---|---|---|
| 2005-06 | 818 | 25% | 204 |
| 2006-07 | 8,819 | 50% | 4,409 |
| 2007-08 | (13,118) | 75% | (9,838) |
| | | | $ (5,225) |

| | |
|---|---|
| **Fair Market Value on June 30, 2008** | $ 96,275 |
| **Less, Asset Smoothing Reserve** | (5,225) |
| **Actuarial Value of Assets on June 30, 2008** | $ 101,500 |

## TABLE 4
## UNFUNDED ACTUARIAL LIABILITY OR ACTUARIAL SURPLUS

| ($000) | 2008 Actuarial Valuation | 2007 Actuarial Valuation |
|---|---|---|
| **Actuarial Value** | | |
| Actuarial Liability | $ 134,683 | $ 128,306 |
| Actuarial Value of Assets | 101,500 | 95,758 |
| Unfunded Actuarial Liability or (Actuarial Surplus) | $ 33,183 | $ 32,548 |
| Funded Ratio (AV) | 75% | 75% |
| **Market Value** | | |
| Actuarial Liability | $ 134,683 | $ 128,306 |
| Market Value of Assets | 96,275 | 102,801 |
| Unfunded Actuarial Liability or (Actuarial Surplus) | $ 38,408 | $ 25,505 |
| Funded Ratio (MV) | 71% | 80% |

## TABLE 5
## ACTUARIAL GAINS AND LOSSES

| ($000) | Expected | Actual | (Gain) or Loss |
|---|---|---|---|
| **2007 Actuarial Liability** | $ 128,306 | | |
| **Normal Cost** | 2,255 | | |
| **Benefits Paid** | (6,889) | | |
| **Expected Earnings at 8%** | 10,079 | | |
| **Actuarial Liability** | $ 133,751 | $ 134,683 | $ 932 |
| **2007 Actuarial Value of Assets** | $ 95,758 | | |
| **Net Cash Flow** | (1,569) | | |
| **Expected Earnings at 8%** | 7,598 | | |
| **Actuarial Value of Assets** | 101,787 | 101,500 | 287 |
| **Unfunded Actuarial Liability or (Actuarial Surplus) as of June 30, 2008** | $ 31,964 | $ 33,183 | $ 1,219 |

| **Summary Actuarial (Gain) or Loss by Source** | |
|---|---|
| Investment (Gain) or Loss | $ 287 |
| Liability (Gain) or Loss | |
| Salary (Gain) or Loss | 473 |
| New Participant (Gain) or Loss | 348 |
| Other (Gain) or Loss | 111 |
| Total Liability (Gain) or Loss | 932 |
| Total Actuarial (Gain) or Loss | $ 1,219 |

## TABLE 6
## CALCULATION OF CONTRIBUTION RATE

| | 2008 Actuarial Valuation* | 2007 Actuarial Valuation |
|---|---|---|
| **Statutory Funding Rate** | | |
| **Members (average)** | 9.05% | 9.05% |
| **Employers** | 26.15 | 26.15 |
| **State** | 10.18 | 10.18 |
| **Total** | 45.38% | 45.38% |
| **Normal Cost Rate** | 22.25 | 22.31 |
| **Funding Rate Available for Amortization** | 23.13% | 23.07% |
| **Unfunded Actuarial Liability (Surplus) ($000)** | $ 33,183 | $ 32,548 |
| Years to Amortize | 17.4 | 19.1 |
| Rate of Amortization Contribution or (Credit) | 23.13% | 23.07% |
| **Calculated Contribution Rate** | | |
| Normal Cost Rate | 22.25% | 22.31% |
| Amortization Payment | 23.13% | 23.07% |
| Total Calculated Rate | 45.38% | 45.38% |

* The numbers above are based on the actuarial value of assets. Based on market assets, the amortization period at June 30, 2008 would be 21.5 years. The information in this footnote is provided in accordance with MCA 19-2-407, to show how market performance is affecting the actuarial funding of the retirement system.

## DISCLOSURE INFORMATION - GASB NO. 25

### TABLE 7
### SCHEDULE OF FUNDING PROGRESS
### (DOLLARS IN THOUSANDS)

| Actuarial Valuation Date | Actuarial Value of Assets | Actuarial Accrued Liability (AAL) | Funded Ratio | Unfunded AAL (UAAL) | Covered Payroll | UAAL as a Percentage of Covered Payroll |
|---|---|---|---|---|---|---|
| June 30, 2000 | 77,810 | 76,397 | 102 | (1,413) | 6,952 | (20) |
| June 30, 2002 | 81,734 | 94,850 | 86 | 13,116 | 7,536 | 174 |
| June 30, 2004 | 79,104 | 104,069 | 76 | 24,965 | 7,844 | 318 |
| June 30, 2005 | 82,050 | 112,938 | 73 | 30,888 | 9,104 | 339 |
| June 30, 2006 | 87,189 | 112,002 | 78 | 24,813 | 7,878 | 315 |
| June 30, 2007 | 95,758 | 128,306 | 75 | 32,548 | 9,858 | 330 |
| June 30, 2008 | 101,500 | 134,683 | 75 | 33,183 | 10,866 | 305 |

### TABLE 8
### SOLVENCY TEST
### (DOLLARS IN THOUSANDS)

| | (1) | (2) | (3) | | Coverage Ratios | | |
|---|---|---|---|---|---|---|---|
| Actuarial Valuation Date | Active Member Accounts | Inactive Actuarial Liability | Employer Financed Active Liability | Actuarial Value of Assets | (1) | (2) | (3) |
| June 30, 2000 | 6,174 [(1)] | 57,422 | 12,801 | 77,810 | 100 | 100 | 111 |
| June 30, 2002 | 6,797 | 68,800 | 19,253 | 81,734 | 100 | 100 | 32 |
| June 30, 2004 | 6,914 | 76,936 | 20,219 | 79,104 | 100 | 94 | 0 |
| June 30, 2005 | 6,981 | 80,701 | 25,256 | 82,050 | 100 | 93 | 0 |
| June 30, 2006 | 7,321 | 83,954 | 20,728 | 87,189 | 100 | 95 | 0 |
| June 30, 2007 | 8,049 | 93,187 | 27,070 | 95,758 | 100 | 94 | 0 |
| June 30, 2008 | 8,796 | 96,395 | 29,492 | 101,500 | 100 | 96 | 0 |

Note:

(1) Prior to 2000, "active member accounts" included Regular Contributions without interest for active and inactive members. Beginning in 2000, "active member accounts" includes Regular and Additional Contributions with interest, and excludes all accounts of inactive members.

# SECTION 4
# ACTUARIAL METHODS AND ASSUMPTIONS

This section of the report describes the actuarial methods and assumptions used in this valuation. These methods and assumptions have been chosen by the Retirement Board based on our recommendations. The Retirement Board has the sole authority to select the methods and assumptions used in this actuarial valuation. The recommendations were formed on the basis of recent experience of the System and on current expectations as to future economic conditions.

The assumptions are intended to estimate the future experience of the System and the members of the System in areas which affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in the estimated costs of the System's benefits.

In our opinion, the current actuarial methods and assumptions are reasonable and appropriate for this System. The assumptions were developed in accordance with generally recognized and accepted actuarial principles and practices that are consistent with applicable Standards of Practice adopted by the American Academy of Actuaries.

## RECORDS AND DATA

The data used in the valuation consist of financial information and records of age, service and income of contributing members, former contributing members and their survivors. All of the data were supplied by the System and are accepted for valuation purposes without audit.

## ACTUARIAL COST METHOD

A fundamental principle in financing the liabilities of a retirement program is that the cost of its benefits should be related to when they are earned, rather than when they are paid. There are a number of methods in use for making a determination.

The funding method used in this valuation is the Entry Age Cost Method. Under this method the actuarial present value of projected benefits for each individual member included in the valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this actuarial present value allocated to a valuation year is called the Normal Cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future Normal Costs is called the Actuarial Liability.

The excess of the Actuarial Liability over the Actuarial Value of Assets is called the Unfunded Actuarial Liability. If the Actuarial Value of Assets exceeds the Actuarial Liability, the difference is called the Actuarial Surplus.

## ASSET VALUATION METHOD

Asset values were supplied by the System and were accepted without audit by us. The Actuarial Value of Assets is the market value, adjusted by a four-year recognition of gains and losses.

## AMORTIZATION METHOD

The amount of the statutory contribution rate in excess of the Employer's normal cost is the level percentage of payroll available to amortize the unfunded actuarial liability. The amortization period is the resulting number of years necessary to fully amortize an unfunded actuarial liability with the available contributions. The calculation of the amortization period assumes future growth in payroll of 4.25% per year.

## INVESTMENT RETURN

The future investment earnings of the assets of the plan are assumed to accrue at a net annual rate of 8.00%, net of all administrative and investment-related expenses.

## INTEREST ON MEMBER CONTRIBUTIONS

Interest on member contributions is assumed to accrue at a net annual rate of 5.00%.

## FUTURE SALARIES

Estimates of future salaries are based on two types of assumptions. Rates of increase in the general wage level of the membership are directly related to inflation, while individual salary changes due to promotion and longevity, referred to as the merit scale, occur even in the absence of inflation. The assumed increase in future salaries due to general wage growth is 4.25% per year. The merit scale, assumed in addition to general wage growth, is shown below.

| Service | Merit Scale |
|---|---|
| 1 | 7.3% |
| 2 | 5.6 |
| 3 | 4.4 |
| 4 | 3.5 |
| 5 | 2.8 |
| 6 | 2.2 |
| 7 | 1.7 |
| 8 | 1.3 |
| 9 | 1.0 |
| 10 | 0.7 |
| 11-15 | 0.4 |
| 16-20 | 0.2 |
| After 20 | 0.0 |

## MORTALITY

The probabilities of mortality are based on the following published tables. We further assume that 70% of all deaths from active membership status are duty-related.

Healthy Retirees and Non-Retired Members
- Males: 1994 Male Uninsured Pensioner Table (–1)
- Females: 1994 Female Uninsured Pensioner Table

Disabled Retirees
- Males: 1994 Male Uninsured Pensioner Table (+3)
- Females: 1994 Female Uninsured Pensioner Table (+2)

Beneficiaries
- Males: 1994 Male Uninsured Pensioner Table (–1)
- Females: 1994 Female Uninsured Pensioner Table (–1)

| | Healthy Members | | Beneficiaries | | Disabled Retirees | |
|---|---|---|---|---|---|---|
| Age | Male | Female | Male | Female | Male | Female |
| 50 | 0.250% | 0.154% | 0.250% | 0.141% | 0.385% | 0.186% |
| 55 | 0.428 | 0.247 | 0.428 | 0.224 | 0.677 | 0.314 |
| 60 | 0.762 | 0.477 | 0.762 | 0.415 | 1.234 | 0.627 |
| 65 | 1.391 | 0.929 | 1.391 | 0.819 | 2.135 | 1.157 |
| 70 | 2.336 | 1.476 | 2.336 | 1.367 | 3.355 | 1.775 |
| 75 | 3.661 | 2.439 | 3.661 | 2.192 | 5.399 | 3.050 |
| 80 | 6.007 | 4.236 | 6.007 | 3.802 | 8.872 | 5.285 |
| 85 | 9.636 | 7.284 | 9.636 | 6.557 | 13.654 | 9.035 |
| 90 | 14.995 | 12.502 | 14.995 | 11.247 | 21.333 | 15.266 |
| 95 | 23.194 | 20.023 | 23.194 | 18.352 | 30.675 | 23.619 |

## SERVICE RETIREMENT

The assumed rates of retirement used in this valuation are shown below.

| Age | w/ 20 Yrs |
|---|---|
| Under 50 | 12% |
| 50 - 54 | 16 |
| 55 | 15 |
| 56 | 15 |
| 57 | 15 |
| 58 | 15 |
| 59 | 15 |
| 60 & over | 100 |

All vested terminated members are assumed to retire when first eligible for an unreduced benefit.

### DISABLEMENT

The assumed rates of disablement are illustrated below at specified ages. We further assume that 10% of all disabilities are duty-related. We also assume that all disabilities are permanent, and no disabled member will recover and return to work.

| Age | Male | Female |
|---|---|---|
| 22 | - | - |
| 27 | 0.10% | 0.10% |
| 32 | 0.10 | 0.10 |
| 37 | 0.10 | 0.10 |
| 42 | 0.40 | 0.40 |
| 47 | 0.40 | 0.40 |
| 52 | 0.40 | 0.40 |
| 57 | 0.40 | 0.40 |
| 62 | 0.00 | 0.00 |

### OTHER TERMINATIONS OF MEMBERSHIP

The assumed rates of termination, other than for retirement, death, or disability, are shown in the following table.

| Service | All Members |
|---|---|
| 0 | 15% |
| 1 | 10 |
| 2 | 10 |
| 3 | 10 |
| 4 | 5 |
| 5-9 | 5 |
| 10-14 | 3 |
| 15 & over | 1 |

The probability of a terminating member electing a refund of the member account balance is shown in the following table.

| Age at Termination | Non-Vested | Vested |
|---|---|---|
| Under 35 | 100% | 70% |
| 35 - 39 | 100 | 60 |
| 40 - 44 | 100 | 40 |
| 45 - 49 | 100 | 40 |
| 50 & over | 100 | – |

### PROBABILITY OF MARRIAGE

100% of all non-retired members are assumed to be married. Male spouses are assumed to be four years older than female spouses.

### Changes in Actuarial Assumptions Made for this Valuation

The following method and assumptions were revised since the last valuation:

#### Actuarial Methods

- None

#### Economic Assumptions

- None

#### Demographic Assumptions

- None

## SECTION 5
## SUMMARY OF BENEFIT PROVISIONS

All of the calculations contained in this report are based on our understanding of the benefit and eligibility provisions of the system. The provisions used in this valuation are summarized below for reference purposes.

| | | |
|---|---|---|
| **Normal Retirement** | Eligibility: | 20 years or more of membership service regardless of age. |
| | Benefit: | Years of service credit, multiplied by highest average compensation, multiplied by 2.50%. |
| | Normal Form: | Monthly benefit for the life of the member, with full benefits continuing to the surviving spouse or dependent children upon the death of the member. |
| **Early Retirement** | Eligibility: | 5 years of membership service and discontinued from service other than for cause. |
| | Benefit: | Actuarial Equivalent of accrued benefit based on a retirement age of 60. |
| **Disability Retirement** | Eligibility: | Service disablement |
| | Benefit: | Minimum of 50% of highest average compensation. |
| | Eligibility: | Non-service disablement |
| | Benefit: | Actuarial equivalent of accrued benefit based on a retirement age of 60. |
| **Death before Retirement** | Eligibility: | Service death |
| | Benefit: | 50% of highest average compensation, less benefits paid from workers' compensation. |
| | Eligibility: | Non-service death |
| | Benefit: | Actuarial equivalent of accrued benefit based on a retirement age of 60. |

**Termination Benefit**

Eligibility: Prior to 5 years of membership service

Benefit: Return of member's accumulated contributions.

Eligibility: 5 years of membership service

Benefit: Either (a) or (b) below:

(a) Return of member's accumulated contributions interest, or

(b) Actuarial equivalent of the accrued benefit based on a retirement age of 60.

**Benefit Adjustments**

Eligibility: Retired members and beneficiaries.

Benefit: Either (a) or (b) below, as elected:

(a) An annual adjustment (GABA) of 3%, commencing January 1st one year after retirement, or

(b) 2% per year of service of the base salary of a probation officer, but not to exceed an increase of 5% per year.

Lump Sum: For non-GABA members retired prior to July 1, 1991, an additional lump sum payment limited to the increase in the Consumer Price Index.

**Contributions**

Members: Either (a) or (b) below:

(a) 9.00% of member's compensation if hired prior to July 1, 1997, or

(b) 9.05% for members hired after June 30, 1997 and those electing GABA.

Employers: 36.33% of member's compensation.

## SECTION 6
## SUMMARY OF MEMBERSHIP DATA

The following tables depict the participant data that was used in the valuation. Table 9 is a history of participant characteristics for the System. Table 10 displays the distribution of Active Members by age and service showing average annual salaries. Table 11 is a distribution of the retirees by age, showing average monthly benefits. Table 12 is a distribution of Vested Inactive Members by age.

### TABLE 9
### MEMBERSHIP HISTORY

| | 2008 | 2007 | 2006 | 2005 | 2004 | 2002 |
|---|---|---|---|---|---|---|
| **Active Members** | | | | | | |
| Number | 212 | 204 | 197 | 201 | 194 | 194 |
| Average Age | 39.7 | 40.0 | 39.7 | 39.1 | 39.2 | 38.9 |
| Average Service | 9.6 | 9.8 | 9.6 | 9.3 | 9.7 | 9.8 |
| Average Salary | $50,505 | $48,392 | $39,582 | $43,223 | $38,669 | $37,518 |
| **Inactive Members** | | | | | | |
| Service Retirement | 208 | 206 | 202 | 202 | 202 | 194 |
| Disability Retirement | 21 | 20 | 20 | 19 | 19 | 19 |
| Survivors | 61 | 58 | 60 | 55 | 53 | 52 |
| Vested Deferred | 13 | 14 | 13 | 10 | 8 | 7 |
| Non-vested Terminated | 7 | 8 | 11 | 9 | 11 | 13 |
| Total Inactive Members | 310 | 306 | 306 | 295 | 293 | 285 |
| **Total Membership** | 522 | 510 | 503 | 496 | 487 | 479 |

Notes:

(1) Beginning in 2000, service retirements exclude members who originally retired on a disability, and beneficiaries of members who died after retirement.

(2) Beginning in 2000, disability retirements include all members who originally retired on a disability, regardless of their current age.

(3) Beginning in 2000, survivors include beneficiaries of members who died after retirement, as well as beneficiaries of members who died prior to retirement.

## TABLE 10
## DISTRIBUTION OF ACTIVE MEMBERS

| Age | Years of Service | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Under 5 | | 5 to 9 | | 10 to 14 | | 15 to 19 | |
| | Number | Average Salary | Number | Average Salary | Number | Average Salary | Number | Average Salary |
| Under 25 | 3 | 42,594 | - | - | - | - | - | - |
| 25-29 | 19 | 44,683 | 1 | 44,703 | - | - | - | - |
| 30-34 | 18 | 44,760 | 11 | 48,762 | - | - | - | - |
| 35-39 | 11 | 44,512 | 19 | 49,492 | 19 | 51,849 | 1 | 64,414 |
| 40-44 | 5 | 44,859 | 14 | 48,795 | 14 | 51,512 | 17 | 58,421 |
| 45-49 | 7 | 40,828 | 6 | 52,069 | 6 | 54,522 | 11 | 54,717 |
| 50-54 | 2 | 46,090 | 2 | 51,909 | 3 | 50,834 | 7 | 53,958 |
| 55-59 | - | - | 1 | 48,955 | - | - | 1 | 51,723 |
| 60-64 | - | - | - | - | - | - | 1 | 53,182 |
| 65-69 | - | - | - | - | - | - | - | - |
| 70 & over | - | - | - | - | - | - | - | - |
| Totals | 65 | 44,221 | 54 | 49,440 | 42 | 52,046 | 38 | 56,370 |

| Age | Years of Service | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20 to 24 | | 25 to 29 | | 30 & Up | | All Years | |
| | Number | Average Salary | Number | Average Salary | Number | Average Salary | Number | Average Salary |
| Under 25 | - | - | - | - | - | - | 3 | 42,594 |
| 25-29 | - | - | - | - | - | - | 20 | 44,684 |
| 30-34 | - | - | - | - | - | - | 29 | 46,278 |
| 35-39 | - | - | - | - | - | - | 50 | 49,590 |
| 40-44 | 2 | 60,671 | - | - | - | - | 52 | 52,752 |
| 45-49 | 5 | 65,011 | - | - | - | - | 35 | 52,922 |
| 50-54 | 2 | 74,068 | 2 | 60,544 | - | - | 18 | 55,302 |
| 55-59 | 2 | 59,662 | - | - | - | - | 4 | 55,000 |
| 60-64 | - | - | - | - | - | - | 1 | 53,182 |
| 65-69 | - | - | - | - | - | - | - | - |
| 70 & over | - | - | - | - | - | - | - | - |
| Totals | 11 | 64,896 | 2 | 60,544 | - | - | 212 | 50,505 |

## TABLE 11
## DISTRIBUTION OF RETIRED MEMBERS

| Age | Service Retirees | | Disabled Retirees | | Survivors | |
|---|---|---|---|---|---|---|
| | Number | Average Monthly Benefit | Number | Average Monthly Benefit | Number | Average Monthly Benefit |
| Under 40 | - | - | 1 | 1,657 | 3 | 952 |
| 40-44 | - | - | 4 | 1,464 | 1 | 2,698 |
| 45-49 | 7 | 2,447 | 1 | 1,638 | 2 | 965 |
| 50-54 | 6 | 2,351 | 3 | 1,555 | - | - |
| 55-59 | 30 | 2,466 | 6 | 1,687 | 3 | 1,136 |
| 60-64 | 44 | 2,459 | 1 | 1,479 | 8 | 1,561 |
| 65-69 | 42 | 2,202 | 3 | 1,459 | 5 | 1,147 |
| 70-74 | 36 | 1,803 | 1 | 1,479 | 13 | 1,581 |
| 75-79 | 25 | 1,537 | 1 | 1,405 | 10 | 1,306 |
| 80-84 | 11 | 1,759 | - | - | 5 | 1,411 |
| 85-89 | 5 | 1,451 | - | - | 6 | 1,300 |
| 90-94 | 1 | 1,479 | - | - | 3 | 1,060 |
| 95-99 | 1 | 1,373 | - | - | 2 | 1,136 |
| 100 & over | - | - | - | - | - | - |
| TOTALS | 208 | 2,109 | 21 | 1,556 | 61 | 1,361 |

## TABLE 12
## DISTRIBUTION OF VESTED INACTIVE MEMBERS

| Age | Number |
|---|---|
| Under 30 | - |
| 30-34 | 2 |
| 35-39 | 3 |
| 40-44 | 1 |
| 45-49 | 3 |
| 50-54 | 3 |
| 55-59 | - |
| 60-64 | - |
| 65-69 | - |
| 70 & over | 1 |
| Total | 13 |